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PROPOSED REMEDIAL ACTION PLAN FOR OPERABLE UNIT 20 (OU 20) SITE 86 MCB CAMP LEJEUNE NC

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Proposed Remedial Action Plan

Site 86: Operable Unit No. 20
Marine Corps Installations East-Marine Corps Base Camp Lejeune, North Carolina

January 2014

1. Introduction

This **Proposed Remedial Action Plan (PRAP)** identifies the Preferred Alternative for addressing **groundwater** contamination at **Site** 86: **Operable Unit (OU)** No. 20, located at Marine Corps Installations East-Marine Corps Base Camp Lejeune (MCIEAST-MCB CAMLEJ) in Onslow County, North Carolina.

The Preferred Alternative for Site 86 is **monitored natural attenuation (MNA)** and **land use controls (LUCs)**. This PRAP is issued jointly by the U.S. Department of the Navy (Navy), the **lead agency** for site activities, MCIEAST-MCB CAMLEJ, and the **U.S. Environmental Protection Agency (EPA)**, in consultation with the **North Carolina Department of Environment and Natural Resources (NCDENR)**, in order to solicit public comments on the remedial alternatives and, in particular, the preferred **remedial action** for Site 86. This PRAP fulfills the public participation responsibilities required under Section 117(a) of the **Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)** and Section 300.430(f)(2) of the **National Oil and Hazardous Substances Pollution Contingency Plan (NCP)**.

This PRAP summarizes the remedial alternatives evaluated for Site 86. Detailed background information for Site 86 is contained in the **expanded supplemental remedial investigation (ESRI)**, the **feasibility study (FS)**, and other documents in the **Administrative Record** file and **Information Repository** for MCIEAST-MCB CAMLEJ (**Table 1**). Key information from the FS report, including the remedial alternatives considered and the rationale for selection of MNA with LUCs as the Preferred Alternative for Site 86, is summarized in this PRAP. A glossary of key terms used in this PRAP is attached, and the terms are identified in bold print the first time they appear.

The Navy, MCIEAST-MCB CAMLEJ, and EPA, in concurrence with NCDENR, will make the final decision on the remedial action for Site 86 after reviewing and considering all information submitted during the 30-day **public comment period**. The Navy and MCIEAST-MCB CAMLEJ, along with EPA, may modify the Preferred Alternative based on new information or public comment. A **Record of Decision (ROD)** will then be prepared to document the Selected Remedy for Site 86. Therefore, public comment on the Preferred Alternative is invited and encouraged. Information on how to participate in the decision making process is presented in Section 10.

2. Site Background

MCIEAST-MCB CAMLEJ is a 156,000-acre facility located in North Carolina, just south of the City of Jacksonville, within Onslow County (**Figure 1**). The mission of MCIEAST-MCB CAMLEJ is to maintain combat-ready units for expeditionary deployment. The Base provides housing, training facilities, and logistical support for Fleet Marine Force Units and other assigned units.

Mark Your Calendar for the Public Comment Period

Public Comment Period

February 10, 2014 - March 14, 2014

Submit Written Comments

The Navy will accept written comments on the PRAP during the public comment period. To submit comments or obtain further information, please refer to the insert page.

Attend the Public Meeting

February 26, 2014 at 6:00PM
Coastal Carolina
Community College
Business Technology Building, BT105
444 Western Blvd
Jacksonville, NC 28546

The Navy will hold a public meeting to explain the PRAP. Verbal and written comments will be accepted at this meeting.

Location of Administrative Record File:

Available online at:
http://go.usa.gov/Dy5T

Internet access is available at the:
Onslow County Library
58 Doris Avenue East
Jacksonville, NC 28540
(910) 455-7350

2.1 Site Description and Background

Site 86 occupies an area of approximately 147 acres aboard Marine Corps Air Station (MCAS) New River in the northwest portion of MCIEAST-MCB CAMLEJ. Approximately half of Site 86 is developed with buildings, parking lots, landscaped areas, and the flight line. The remaining portion of the site is an open, grassy area (**Figure 2**).

The **chemicals of concern (COCs)** at Site 86 are **volatile organic compounds (VOCs)** in groundwater, including benzene, trichloroethene (TCE), tetrachloroethene (PCE), cis 1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride (VC). The potential **sources** of contamination include the following:

- Aboveground Storage Tank (AST) area—Contained three 25,000-gallon ASTs that held fuel oil from 1954 until 1974 and waste oil from 1974 to 1988. The tanks were emptied and removed in 1992.
- Helicopter Wash Pad—Used nozzles embedded in the tarmac to clean aircraft from 1968 until abandonment in 2001.
- Several hangars that housed carburetor, battery, and engine buildup shops used for aircraft maintenance.
- Solid Waste Management Unit (SWMU) 303—Consisted of two former steel ASTs that were contained within a concrete, bermed structure.
- SWMU 318—Consisted of concrete, multichambered oil/water separator and grit chamber associated with the former Helicopter Wash Pad.
- Gas station and garage.
- UST AS-510—Located near the footprints of three former buildings used for various activities, including a steam power plant and waste storage.

2.2 Summary of Previous Investigations, Studies, and Removal Actions

Site 86 was characterized under numerous investigations, removal actions, and studies conducted between 1990 and 2013. **Table 1** presents a chronological list of those studies.

3. Site Characteristics

The topographic relief within Site 86 ranges from 8 to 20 feet above mean sea level with a slight slope to the east toward the New River. Stormwater runoff from the western portion

Figure 1 - Base and Site Location Map

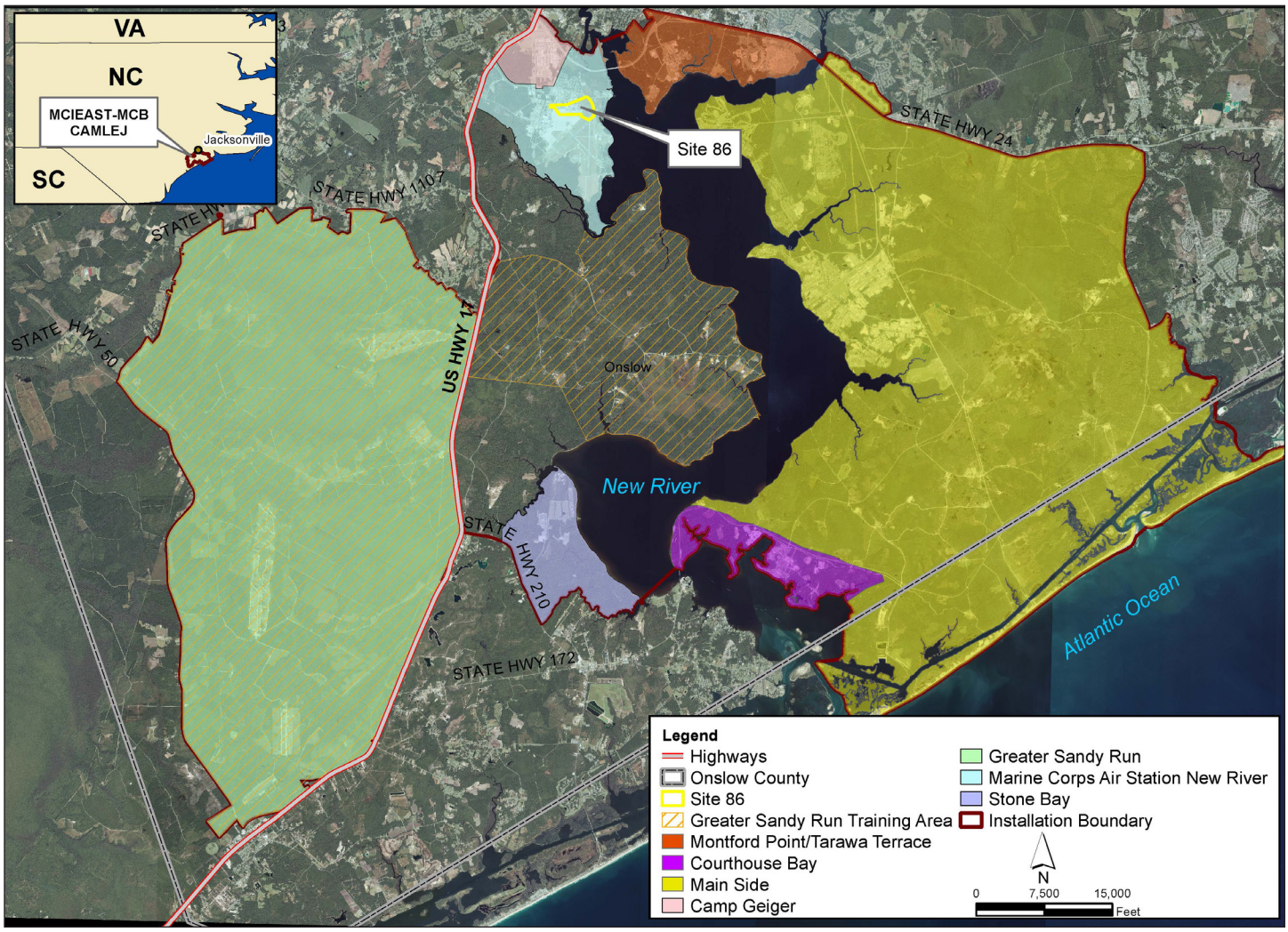
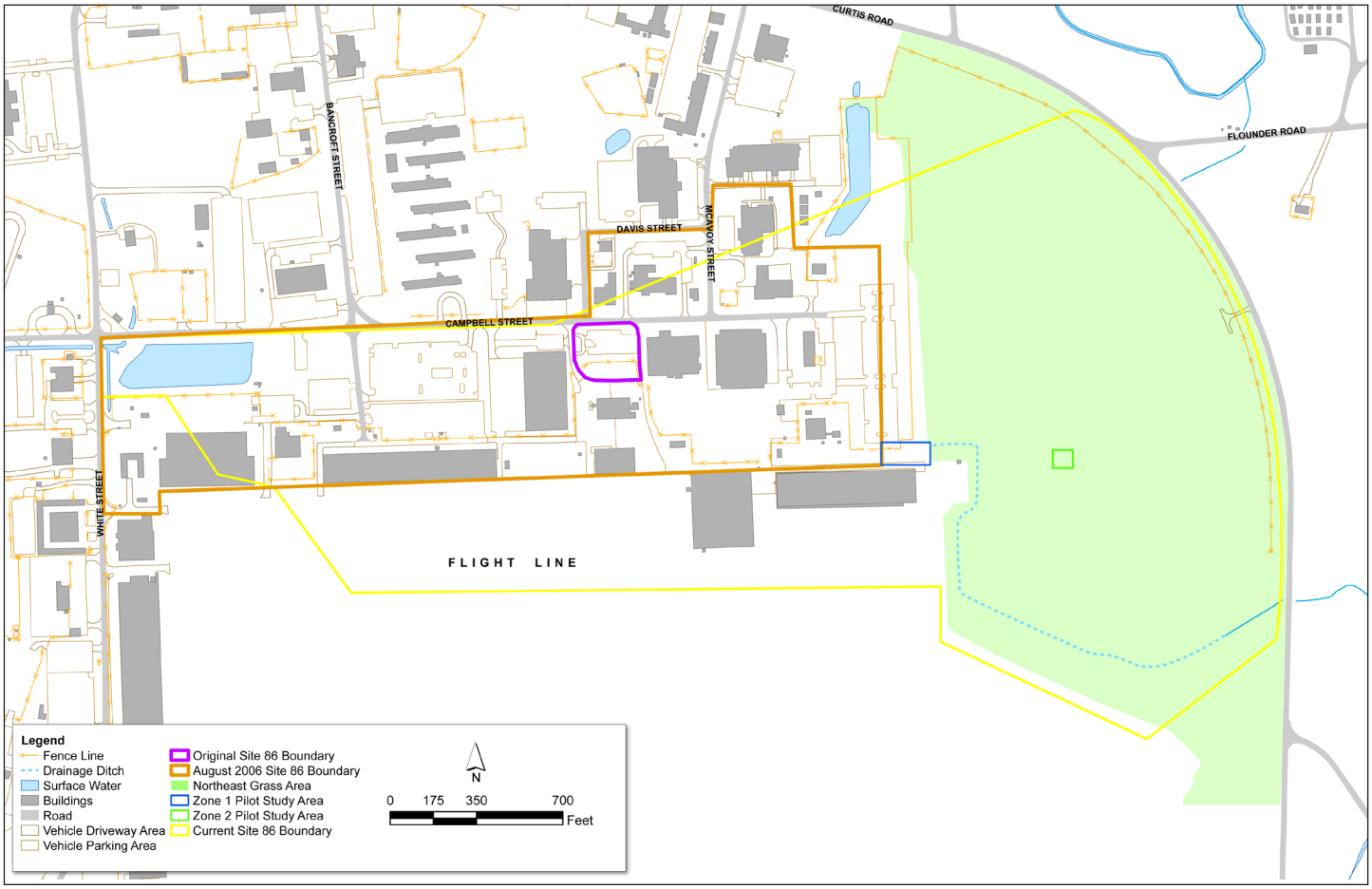


Figure 2 – Site Boundaries Map



of the site flows east through storm drains that discharge to a drainage ditch. Stormwater from the northern portion of the site flows to a retention pond. Stormwater that has not infiltrated the ground surface eventually discharges to the New River. Since the northern and western portions of the site are generally paved or developed, it is anticipated that infiltration rates are low. However, higher rates of infiltration are expected in the northeast grass area.

Groundwater investigations completed at Site 86 have focused on the surficial aquifer and underlying Castle Hayne aquifer designated as follows: surficial aquifer (5 to 25 feet below ground surface [bgs]), upper Castle Hayne aquifer (25 to 60 feet bgs), and middle Castle Hayne aquifer (greater than 60 feet bgs).

Potable water for MCIEAST-MCB CAMLEJ and the surrounding residential area is provided by public water supply wells that pump groundwater from the Castle Hayne aquifer. Regionally in southeastern North Carolina, the Castle Hayne aquifer may be used as a potable source of domestic water supply, for watering lawns, or for filling swimming pools. All potable supply wells at MCAS New River are located upgradient of Site 86.

3.1 Nature and Extent of Contamination

The surficial and upper Castle Hayne aquifers at Site 86 are impacted by the following VOCs: benzene, PCE, TCE, cis-1,2-DCE, and VC. The five VOCs have been detected in groundwater samples collected from the surficial and upper Castle Hayne aquifers at concentrations exceeding the North Carolina Groundwater Quality Standard (NCGWQS) and/or Federal maximum contaminant levels (MCLs).

As shown in the conceptual site model (CSM), presented in **Figure 3**, the westernmost groundwater plume appears to have originated near the aircraft hangars located on the western portion of the flight line and is likely a result of surficial releases associated with the former aircraft maintenance operations. The central groundwater plume appears to have originated near the original Site 86 boundary (AST area) and is likely the result of surficial releases associated with former aircraft maintenance activities. The easternmost groundwater plume appears to be associated with an open, unlined drainage ditch that receives surface water runoff from the stormwater conveyance network within the eastern portion of the flight line.

Table 2 provides the maximum concentrations detected for each COC in groundwater at Site 86 by aquifer, and **Figure 3** shows the horizontal and vertical extents of the COCs by aquifer. Generally, COCs were more prevalent and detected at higher concentrations in samples collected from the upper Castle Hayne aquifer monitoring wells than in the samples collected from the surficial aquifer.

Table 1 - Summary of Previous Investigations

Previous Investigations/ Actions*	Administrative Record Numbers	Dates	Activities and Findings
Preliminary Site Investigation, Dewberry & Davis, January 1991	Pending	1990	In 1990, a preliminary site investigation was conducted to evaluate the Site 86 AST area. Soil samples were collected, and analytical data indicated that total petroleum hydrocarbons and VOCs were present in soil and were likely attributable to localized surface spills from ASTs.
Site Assessment, O'Brien & Gere, Inc., June 1992	Pending	1992	In 1992, a site assessment was completed at the Site 86 AST area. Soil and groundwater samples were collected. Analytical results indicated that soil and groundwater collected were impacted with total petroleum hydrocarbons and VOCs.
Remedial Investigation (RI), Baker Environmental, Inc., August 1996	001719 and 001720	1996	In 1995, an RI was conducted to characterize the nature and extent of contamination identified in the site assessment. Surface and subsurface soil samples contained metals and semi-volatile organic compounds (SVOCs) and groundwater samples contained VOCs and metals at concentrations above the human health risk based levels.
Post-RI Activities, Baker Environmental, Inc., June 1998	003775	1998	In 1997, post-RI activities were conducted to refine the horizontal and vertical extent of VOCs in groundwater. Groundwater analytical data indicated that the horizontal extent of VOCs in groundwater was not delineated.
Amended RI, CH2M HILL, Baker Environmental, Inc., May 2003	003740	2003	In 2001–2002, Amended RI investigation activities were conducted to further characterize the groundwater contamination and to reevaluate impacts to human health and the environment identified in the RI. The Amended RI concluded that the extent of VOC contamination in the soil was limited, and that two groundwater plumes were present near Site 86. The plume near Site 86 was adequately defined; however, an unrelated upgradient plume was not defined.
Resource Conservation and Recovery Act Facilities Investigation (RFI), CH2M HILL/ Baker Environmental, Inc., March 2006	Pending	2005-2006	In 2005–2006, an RFI was conducted to evaluate SWMUs 303 and 318. Surface and subsurface soil samples and groundwater samples contained concentrations of VOCs, SVOCs, and metals above human health risk-based levels. The RFI recommended the removal of SVOC- and metal-impacted soil from beneath the wash pad near SWMUs 303 and 318 and further investigation of groundwater contamination to determine the source of the VOCs.
Interim Measure, Shaw Environmental and Infrastructure, Inc., March 2006	Pending	2006	In 2005, approximately 1,200 tons of SVOC- and metal-impacted soil identified during the RFI was removed from SWMUs 303 and 318 under an Interim Measure. Confirmatory soil samples indicated that all target contaminants were below applicable screening criteria.

Table 1 - Summary of Previous Investigations

Previous Investigations/Actions*	Administrative Record Numbers	Dates	Activities and Findings
Air/Ozone Pilot Study, CH2M HILL, September 2006	003942	2004-2006	In 2004, a Pilot Study was conducted to evaluate the effectiveness of air sparging utilizing a horizontal directionally drilled well for transferring TCE mass in the target area. A 950-foot-long, 65-foot-deep horizontal directionally drilled well was constructed with a 350-foot section of screen. Twelve monitoring wells were installed in the upper Castle Hayne **aquifer**, and periodic groundwater monitoring was conducted from 16 wells (12 new wells and 4 existing wells).Beginning in February 2005, the air sparge system was operated nearly continuously for approximately six months. From late July 2005 to late January 2006, a combined air and ozone sparge system was operated. The results indicated that TCE was reduced by 99 percent. The zone of influence created by sparging operations was observed to propagate 50 feet on either side of the horizontal directionally drilled well. Groundwater samples collected from wells within the mass transfer area contained target VOCs below the NCGWQS within one year of the start of system operation.
Expanded Supplemental Remedial Investigation, CH2M HILL, February 2011	004731	2006–2010	An ESRI was conducted in a phased approach from 2006 to 2010 to present a complete history of the investigation activities, assess the current nature and extent and fate and transport of contamination, and quantify the potential risks to the human and ecological receptors. Passive soil gas, soil, groundwater, sediment, and surface water samples were collected and evaluated. SVOCs, pesticides, and metals were detected in soil at concentrations consistent with industrial use of the area and background concentrations for metals. Chlorinated VOCs and benzene are the primary contaminants in groundwater samples collected from the surficial and upper Castle Hayne aquifers. Isolated concentrations of PCE, polycyclic aromatic hydrocarbons (PAHs), and chromium were reported in the samples collected from the middle Castle Hayne aquifer, but they did not appear to be vertically or laterally extensive. Unacceptable human health risks were identified based on the following: • Exposure to chromium in surface soil by hypothetical future residents. • Future potable use of surficial aquifer and upper Castle Hayne aquifer groundwater by residents or industrial workers from exposure to VOCs. • Future potable use of middle Castle Hayne aquifer groundwater from exposure to chloroform, PAHs, and chromium. The ecological risk assessment concluded that the overall risk to ecological receptors was acceptable. An FS was recommended to identify remedial action objectives and identify and evaluate remedial alternatives to address the potential human health risks identified.

Table 1 - Summary of Previous Investigations

Previous Investigations/Actions*	Administrative Record Numbers	Dates	Activities and Findings
Basewide Vapor Intrusion Evaluation, AGVIQ/CH2M HILL, November 2009 and CH2M HILL, October 2011	002772 through 002777 and 004694 through 004698	2007-2011	Site 86 was included in the phased Basewide vapor intrusion evaluation to determine if complete or significant exposure pathways exist into buildings. Current subslab soil gas concentrations were within an estimated target risk range; therefore, it was concluded that vapor intrusion is not a current significant pathway of concern for the buildings evaluated at Site 86. If new buildings are planned for construction in the vicinity of the VOC groundwater plume, the potential for a vapor intrusion pathway was recommended to be re-evaluated and mitigated if needed.
Expanded Soil Background Study Report, CH2M HILL, October 2011	004705 and 04706	2011	Surface and subsurface soil samples were collected from developed and undeveloped areas of MCIEAST-MCB CAMLEJ to evaluate background threshold values (BTVs) for use in site-specific environmental investigations and risk assessments. The BTVs were not available at the time the ESRI was completed; therefore, the BTVs were used to re-evaluate potentially unacceptable risks identified in the ESRI. This risk evaluation is discussed in the FS.
Feasibility Study, CH2M HILL, October 2013	Pending	2012–2013	The FS re-evaluated potential unacceptable human health risks identified in the ESRI from exposure to soil and middle Castle Hayne aquifer groundwater as follows: • Soil—Between the time the ESRI and FS were completed, additional Base background soil data were collected, and concentrations of both naturally occurring total chromium and hexavalent chromium were measured. Based on the chromium speciation data, a ratio of hexavalent chromium to total chromium of 1:5 was calculated. Once the ratio was applied to the total chromium data from Site 86, the maximum estimated concentrations of hexavalent chromium were within the acceptable cancer risk range. • Middle Castle Hayne aquifer groundwater—Potential risks identified were associated with COCs (chloroform, PAHs, and chromium) detected in one groundwater sample from one well. Based on the infrequency of detections, low concentrations, and laboratory qualifiers associated with the detections (estimated concentrations), the well was re-sampled, and the COCs were not detected. Therefore, groundwater from the middle Castle Hayne aquifer does not pose unacceptable risk. A pilot study was conducted to assist with the evaluation of potential remedial alternatives. The study was conducted in two zones: in situ chemical oxidation (ISCO) using slow-release permanganate candles in the surficial aquifer and an enhanced reductive dechlorination (ERD) injection/extraction recirculation system in the upper Castle Hayne aquifer. At the conclusion of the study, analytical data from the surficial aquifer indicated a decrease after 3 months of treatment, but experienced a slight rebound after 9 months of treatment due to the low seepage velocity and high oxidant demand; however, analytical data from the upper Castle Hayne aquifer indicated that overall concentrations of VOCs in the upper Castle Hayne aquifer had decreased by approximately 80 percent relative to baseline concentrations. The following remedial alternatives were evaluated to address the remaining potential risks from future potable use of surficial aquifer and upper Castle Hayne aquifer groundwater containing VOCs: • Alternative 1 – No Action • Alternative 2 – MNA and LUCs • Alternative 3 – Air Sparging with MNA and LUCs • Alternative 4—ISCO with MNA and LUCs • Alternative 5—ERD with MNA and LUCs

*Documents listed are available in the Administrative Record and provide detailed information to support remedy selection at Site 86.

Table 2 - Maximum Concentration of COCs

COCs	NCGWQS/MCL* (µg/L)	Maximum Concentration (µg/L)	
		Surficial Aquifer (Date)	Upper Castle Hayne Aquifer (Date)
Benzene	1	11 (December 2009)	4 (December 2009)
PCE	0.7	190 (December 2009)	0.28 J (December 2009)
TCE	3	170 (May 2012)	710 (December 2009)
cis-1,2-DCE	70	150 J (December 2009)	350 J (December 2009)
VC	0.03	68 J (December 2009)	76 (May 2012)

J – Reported value is estimated
µg/L – micrograms per liter
*NCGWQS or MCL, whichever is more conservative

3.2 Fate and Transport of Contamination

The primary contaminant migration pathway is groundwater flow through the surficial and upper Castle Hayne aquifers. Groundwater flows generally to the east/northeast towards the New River. Vertical migration appears to be limited to the surficial and upper Castle Hayne aquifers based on the lack of detections of VOCs in the middle Castle Hayne aquifer.

Conditions in the surficial and upper Castle Hayne aquifers at Site 86 are generally favorable for **natural attenuation (NA)** processes and exhibit evidence that NA is occurring. Lines of evidence that support this conclusion include the following:

- Decrease in parent VOC concentrations (PCE and TCE) in groundwater and/or mass and the presence and sitewide distribution of VOC degradation products (cis-1,2-DCE and VC) in groundwater indicates natural biodegradation is occurring.
- Favorable MNA scoring using EPA guidance (EPA, 1998) for high concentration areas within the upper Castle Hayne plume (**Figure 4**).
- Presence of microbial populations of dehalogenating bacteria (Dehalococcoides, Desulfuromonas sp., Dehalobacter sp., and Desulfitobacterium sp.) in the upper Castle Hayne wells to support reductive dechlorination.

3.3 Principal Threats

Principal threat wastes are source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should they be exposed. Contaminated groundwater generally is not considered to be a source material; however, **nonaqueous phase liquids (NAPLs)** in groundwater may be viewed as a source material. Dissolved concentrations of VOCs in groundwater at approximately

Figure 3 - Conceptual Site Model

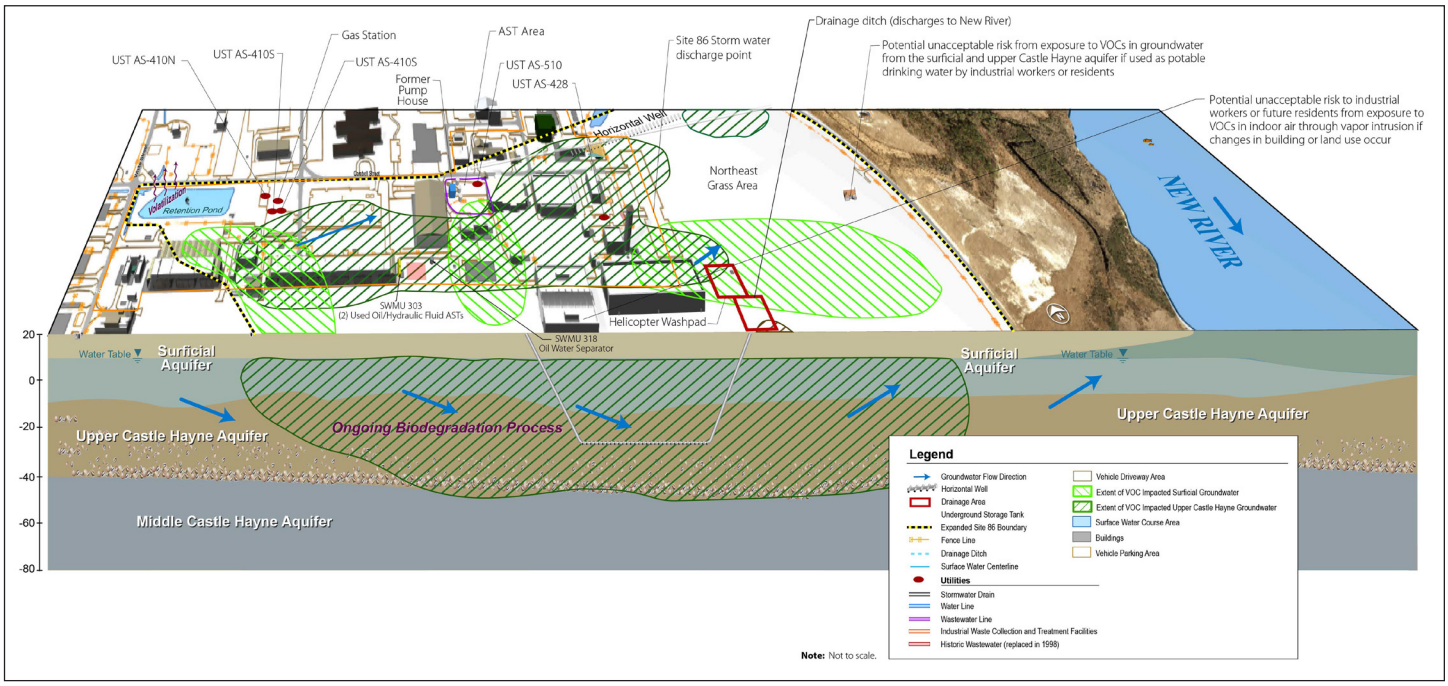
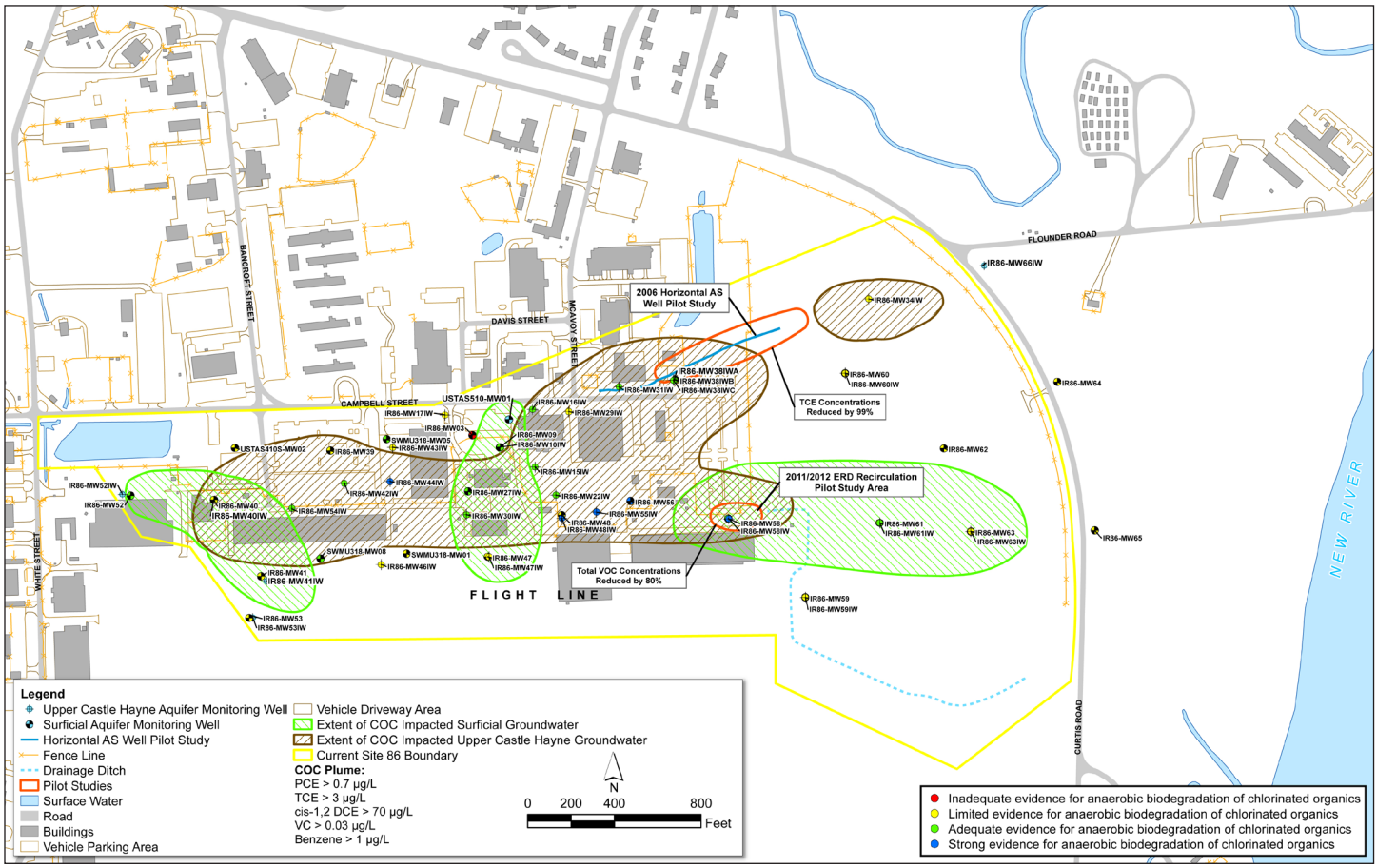


Figure 4 - Extent of COC Impacts



1 to 5 percent of a compound's solubility could suggest the presence of dense nonaqueous phase liquids (DNAPL) in the subsurface. The maximum concentration of TCE was observed in the upper Castle Hayne aquifer at a concentration of 0.710 milligrams per liter (mg/L), which is 0.055 percent of the water solubility of TCE (1,280 mg/L). DNAPL has not been observed during groundwater sampling activities. Based on these lines of evidence, DNAPL is not likely present at the site.

4. Scope and Role of Response Action

MCIEAST-MCB CAMLEJ was placed on EPA's **National Priorities List (NPL)** effective November 4, 1989 (54 Federal Register 41015, October 4, 1989) under the narrative "Camp Lejeune Military Reservation (USNAVY)" and EPA ID# NC6170022580. There are 25 discrete OUs under CERCLA investigation at MCIEAST-MCB CAMLEJ. OU No. 20 is one of the 25 OUs in the **Installation Restoration Program (IRP)** and consists of one site, Site 86.

Information on the status of all the OUs and sites at MCIEAST-MCB CAMLEJ can be found in the current version of the site management plan, available in the Administrative Record.

5. Summary of Site Risks

Potential human health and ecological risks from exposure to environmental **media** at Site 86 were evaluated as part of the ESRI, Basewide Vapor Intrusion Evaluation, and FS. The following subsections and **Table 3** summarize the risk assessment results.

Table 3 - Site 86 Risk Summary

Media	Human Health Risk	Ecological Risk
Surface Soil	Acceptable	Acceptable
Subsurface Soil	Acceptable	Not Applicable*
Surface Water	Acceptable	Acceptable
Groundwater	Unacceptable	Not Applicable*
Indoor Air	Acceptable	Not Applicable*

*Ecological receptors are not exposed to subsurface soil, groundwater, or indoor air

5.1 Human Health Risk Summary

The **human health risk assessment (HHRA)** was completed to evaluate the potential impact from exposure to surface soil, subsurface soil, surface water, sediment, groundwater, and **vapor intrusion** at Site 86.

Potential exposure pathways evaluated included the following:

- Contact with combined surface and subsurface soil by future residents, construction workers, military personnel, industrial workers, maintenance workers, and trespassers/visitors (adult and youth)

- Contact with surface water and sediment by current and future military personnel, maintenance workers, and trespassers/visitors (adult and youth), and future construction workers and residential **receptors** (adult and child)
- Contact with surficial groundwater during construction or excavation activities (future construction worker exposure)
- Contact with surficial or upper Castle Hayne groundwater used as a potable water supply (future industrial worker and/or residential receptor exposure)
- Inhalation of indoor air associated with vapor intrusion from groundwater (current and future industrial worker exposure and future residential receptor exposure)

Health risks are based on a conservative estimate of the potential **cancer risk** or the potential to cause other health effects not related to cancer [noncancer hazard, or **hazard index (HI)**]. EPA identifies an acceptable cancer risk range of 1 in 10,000 (10^{-4}) to 1 in 1,000,000 (10^{-6}) and below and an acceptable noncancer hazard as an HI that does not exceed 1.

The estimates of risk at Site 86 were used to determine if any further actions were required to sufficiently protect human health. The HHRA concluded the following:

- There is no unacceptable risk from exposure to surface soil, subsurface soil, surface water, sediment, and middle Castle Hayne groundwater.
- There is a potential unacceptable risk from exposure to VOCs (listed in **Table 2**) in groundwater from the surficial and upper Castle Hayne aquifers, if used as potable drinking water by industrial workers or residents.
- While VOCs were detected in groundwater at concentrations above vapor intrusion groundwater screening levels for an industrial building, current subslab soil gas concentrations result in estimated risk within the target risk range; therefore, vapor intrusion is not a significant pathway of concern based on current site use. However, the pathway would need to be re-evaluated if new construction were to take place or if future land uses changes.

The CSM (**Figure 3**) depicts the potential unacceptable risk identified at Site 86, including the exposure media, exposure routes, and potential human health receptors.

5.2 Ecological Risk Summary

The **ecological risk assessment (ERA)** was conducted as part of the 2011 ESRI to evaluate potential risks to ecological receptors. Risk was estimated by calculating **hazard quotients (HQs)** using the concentration of each contaminant in applicable media (soil, surface water, and sediment) and dividing by an ecological screening value (ESV). Contaminants were retained for further assessment if the HQ was greater than 1 (the concentration exceeded the ESV), the contaminant was detected but did not have an ESV, or the contaminant was not detected but the reporting limit was greater than the ESV. The list of COCs was further refined using a weight-of-evidence approach that considered spatial and temporal distribution of analytical results, the general ecological setting and health of the ecosystems, and food web modeling.

The results indicated that no constituents in soil, surface water, and sediment were identified that are expected to a cause a significant risk to populations of ecological receptors at Site 86.

6. Remedial Action Objectives

The role of the Preferred Alternative presented in this PRAP is to address the unacceptable risks posed by Site 86 and to eliminate current exposure pathways that may pose unacceptable human health risk. It is the current judgment of the Navy, MCIEAST-MCB CAMLEJ, and EPA, in concurrence with NCDENR, that the Preferred Alternative identified in this PRAP is necessary to protect public health or welfare of the environment from actual or threatened releases of hazardous substances into the environment.

In order to be protective of human health and the environment and address potential future risks identified in the HHRA, the **Remedial Action Objectives (RAOs)** identified for Site 86 are as follows:

- Restore groundwater quality to meet NCDENR and federal primary drinking water standards based on the classification of the aquifer as a potential source of drinking water (Class GA or Class GSA) under 15A North Carolina Administrative Code 02L.0201.
- Prevent exposure to COCs in groundwater and vapor intrusion from COCs in groundwater until such time as groundwater concentrations or vapor intrusion mitigation measures allow for unlimited use and unrestricted exposure.

Cleanup levels were developed for COCs contributing to unacceptable risks and hazards from exposure to groundwater at Site 86 and are based upon chemical-specific **applicable or relevant and appropriate requirements (ARARs)**.

The cleanup levels for groundwater are presented in **Table 4** and are based on the NCGWQS or Federal maximum contaminant levels (MCLs), whichever is more stringent. In this case, the NCGWQS are more stringent than the MCL for all site COCs.

Table 4 – Groundwater Cleanup Levels

COC	NCGWQS/MCL* (µg/L)
Benzene	1
PCE	0.7
TCE	3
cis-1,2,-DCE	70
VC	0.03

µg/L – micrograms per liter

*NCGWQS or MCL, whichever is more conservative

7. Summary of Remedial Alternatives

The remedial alternatives that were developed and evaluated to address VOCs in groundwater at Site 86 are detailed in the FS. A summary of remedial alternatives is presented in **Table 5**.

With the exception of the No Action alternative, all alternatives comply with ARARs, have the same RAOs, expected outcomes, and anticipated future land uses. The No Action alternative does not protect human health and the environment, but is presented as a baseline for comparison purposes.

8. Evaluation of Alternatives

The NCP outlines the approach for comparing remedial alternatives using the **nine evaluation criteria** listed in the following subsections (see the Glossary for a detailed description of each). Each remedial alternative for Site 86 was evaluated against the criteria. A summary of the comparative analysis of the alternatives is presented in the following subsections and in **Table 6**.

8.1 Threshold Criteria

Overall Protection of Human Health and the Environment

All of the alternatives screened, with the exception of the No Action alternative, are protective of human health and the environment by reducing or controlling risks posed by the site through remedial strategies and/or LUCs.

Alternatives 3 (**air sparging [AS]**), 4 (**ERD**), and 5 (**ISCO**) provide active treatment/mass transfer to reduce the concentrations of COCs in groundwater, potentially expediting the NA process. LUCs will provide protection until RAOs are achieved for Alternatives 2 (MNA), 3 (AS), 4 (ERD), and 5 (ISCO).

Compliance with ARARs

Section 121(d) of CERCLA, as amended, specifies in part, that remedial actions for cleanup of hazardous substances must comply with the requirements and standards under federal or more stringent state environmental laws and regulation that are ARARs to the hazardous substances or particular circumstances at a site unless such ARAR(s) are waived under CERCLA Section 121(d) (4). See also 40 Code of Federal Regulations (CFR) § 300,430(f)(1)(ii)(B).

All alternatives, except the No Action alternative, are expected to comply with ARARs. Alternatives 2 (MNA), 3 (AS), 4 (ISCO), and 5 (ERD) would comply with chemical-specific ARARs (NCGWQS and MCLs) through monitoring and LUCs to prevent exposure to contaminated media (Alternative 2 [MNA]) or active treatment or mass transfer to reduce contaminant concentrations in groundwater (Alternatives 3 [AS], 4 [ISCO], and 5 [ERD]). All alternatives, except No Action, would also comply with action-specific ARARs, including North Carolina regulations for monitoring well construction, abandonment, and associated waste management, and underground injection requirements (Alternatives 3 [AS], 4 [ISCO], and 5 [ERD]). Alternatives 3 (AS), 4 (ISCO), and 5 (ERD) would comply with applicable location-specific ARARs for actions performed in wetlands and in a coastal zone.

8.2 Primary Balancing Criteria

Long-term Effectiveness and Permanence

Each alternative, except the No Action alternative, provides some degree of long-term protection that increases if mass transfer and treatment components are included. The effectiveness and permanence of Alternative 2 (MNA) is dependent entirely upon NA, whereas Alternatives 3 (AS), 4 (ISCO), and 5 (ERD) employ active treatment and mass transfer to reduce the concentrations of COCs in groundwater, and then rely on NA to reduce COCs in groundwater to their respective cleanup levels. Therefore, Alternatives 3 (AS), 4 (ISCO), and 5 (ERD) will likely reach the cleanup levels in a shorter timeframe than Alternative 2 (MNA).

Rebound is a potential issue with any injection or AS scenario; therefore, subsurface distribution is the key to effectiveness and treatment timeframe. Due to the possibility of rebound, multiple injections (or system restart for AS) may be required for Alternatives 3 (AS), 4 (ISCO), and 5 (ERD). However, Alternative 5 (ERD) may have a slightly higher long-term effectiveness because it may provide a longer, more sustained treatment of potential contaminant rebound as bioaugmentation will likely increase the biodegradation potential of the aquifer after the initial substrate injection and extraction.

Reviews conducted at least every 5 years, as required by CERCLA, would be necessary to evaluate the effectiveness of any of the alternatives because hazardous substances would remain onsite at concentrations above levels that allow for unlimited use and unrestricted exposure.

Reduction of Toxicity, Mobility, or Volume through Treatment

Alternatives 3 (AS), 4 (ISCO), and 5 (ERD) would reduce toxicity, mobility, and volume through treatment. The technologies are effective at reducing the concentrations of chlorinated VOCs in groundwater; however, AS and MNA are typically more effective technologies at removing benzene from groundwater than ISCO and ERD. Although Alternative 2 (MNA) does not include active treatment, natural reduction of VOC concentrations through a variety of physical, chemical, or biological activities will occur over time.

Alternative 4 (ISCO) is expected to provide the fastest reduction in toxicity and volume of chlorinated VOCs in groundwater through chemical oxidation, while with Alternative 5 (ERD) would provide for reduction at a slower rate because it is dependent on biological processes. Alternative 3 (AS) would reduce toxicity and volume; however, AS is not a destructive process and the transferred mass of VOCs, if not biodegraded aerobically in the vadose zone, would release into the atmosphere. Therefore, Alternatives 4 (ISCO) and 5 (ERD) provide the highest reduction of toxicity, mobility, and volume through treatment followed by Alternative 3 (AS).

Table 5 - Summary of Remedial Alternatives for Site 86

Alternative	Components	Details	Cost//Timeframe	
1 – No Action	None	None	Total Cost	$0
			Timeframe	Indefinite
2 – MNA and LUCs	MNA	NA process to reduce sitewide concentrations of VOCs in groundwater. Groundwater monitoring annually for VOCs and every 5 years for natural attenuation indicator parameters (NAIPs) to evaluate trends over time and progress towards meeting the cleanup levels.	Capital Cost	$28,000
			Total Monitoring Cost	$557,000
			Total Present Value Cost	$585,000
			Timeframe	53 Years
	LUCs	LUCs to prohibit aquifer use and to require evaluation of vapor intrusion if future changes in building or land use occur.		
3 – Air Sparging, MNA, and LUCs	Air Sparging	Injection of air to induce mass transfer (stripping) of VOCs from groundwater and/or aerobic biodegradation. Installation of two air sparging wells in the surficial aquifer and six air sparging wells in the upper Castle Hayne aquifer in the treatment areas. Operation of the air sparging systems would continue for up to 5 years.	Capital Cost	$3,419,000
			MNA	$2,042,000
			Total Present Value Cost	$5,461,000
			Timeframe	40 Years
	MNA	MNA would initially be implemented outside the treatment areas on select wells, and would later be implemented sitewide after active air sparging operations ceased. Groundwater monitoring annually for VOCs and every 5 years for NAIPs to evaluate trends over time and progress towards meeting the cleanup levels.		
	LUCs	LUCs to prohibit aquifer use and to require evaluation of vapor intrusion if future changes in building or land use occur.		
4 – ISCO, MNA, and LUCs	ISCO of VOCs	Injection of chemical oxidant permanganate to chemically degrade VOCs in groundwater. Installation of 68 injection wells in the surficial and upper Castle Hayne aquifers. Injection of approximately 3,304,029 gallons of 4 percent potassium permanganate solution.	Capital Cost	$7,376,000
			Total Monitoring Cost	$535,000
			Total Present Value Cost	$7,911,000
			Timeframe	40 Years
	MNA	MNA would initially be implemented outside the treatment areas on select wells, and would later be implemented sitewide following active treatment. Groundwater monitoring annually for VOCs and every 5 years for NAIPs to evaluate trends over time and progress towards meeting the cleanup levels.		
	LUCs	LUCs to prohibit aquifer use and to require evaluation of vapor intrusion if future changes in building or land use occur.		

Table 5 - Summary of Remedial Alternatives for Site 86

5 – ERD, MNA, and LUCs	Enhanced bioremediation	Injection of electron donor substrate consisting of 50 percent emulsified vegetable oil and 50 percent lactate to promote anaerobic biodegradation of VOCs by reductive dechlorination. Installation of 68 injection wells in the surficial and upper Castle Hayne aquifers. Injection of approximately 260,000 gallons of emulsified vegetable oil-lactate solution.	Capital Cost Total Monitoring Cost Total Present Value Cost Timeframe	$2,954,000 $697,000 $3,651,000 40 Years
	MNA	MNA would initially be implemented outside the treatment areas on select wells, and would later be implemented sitewide following active treatment. Groundwater monitoring annually for VOCs and every 5 years for NAIPs to evaluate trends over time and progress towards meeting the cleanup levels.		
	LUCs	LUCs to prohibit aquifer use and to require evaluation of vapor intrusion if future changes in building or land use occur.		

Short-term Effectiveness

Short-term effectiveness, in terms of risks to workers, the community, and environment during implementation, would be lowest for Alternative 2 (MNA) since no construction is involved with the implementation of the remedy. Alternative 2 also has the lowest potential environmental impacts during implementation since no active treatment would be performed, only groundwater monitoring.

Risks to workers, the community, and the environment are higher for the active treatment Alternatives 3 (AS), 4 (ISCO), and 5 (ERD) but would be minimized through the use of appropriate personal protective equipment, air monitoring, and engineering controls to prevent any spills or damage to the environment. Although the period of time to implement Alternatives 3 (AS) and 4 (ISCO) are similar to Alternative 5 (ERD), the risks to workers are generally higher. This is due to increased labor required to perform operations and maintenance to the AS system, the elevated risks associated with handling a strong oxidant during the ISCO injection and recirculation activities, and the potential for AS to increase risks to Base workers from vapor intrusion into occupied buildings.

The potential environmental impacts (greenhouse gas or air pollutant emissions from running equipment or vehicle emissions) and resource use (water or energy) were evaluated for each active remedy (AS, ISCO, or ERD). Alternative 3 (AS) had the highest potential environmental impacts primarily from electricity use during system operations. Alternatives 4 (ISCO) and 5 (ERD) had similar potential environmental impacts with ISCO having higher water use to dilute the chemicals before injection.

Implementability

Each alternative is technically and administratively feasible with services and materials required to implement the remedy readily available. Alternative 2 (MNA) has the highest implementability of all the remedies evaluated because it requires no construction and the site labor is limited to sampling activities. However, the implementability of Alternatives 3 (AS), 4 (ISCO), and 5 (ERD) decrease significantly because Site 86 is located on an active military flight line with multiple areas of limited or restricted access that may preclude the installation of a sitewide remediation system infrastructure. The alternatives involve drilling, construction, and maintenance activities that will likely disrupt flight line operations. Additionally, subsurface injections of air or liquid rely heavily on distribution throughout the impacted media. Since the aquifer media is not uniform, preferential flow through more porous media may cause inadequate contact with contaminated groundwater. Therefore, Alternatives 3 (AS), 4 (ISCO), and 5 (ERD) are considered to have moderate implementability.

Cost

An order-of-magnitude cost for each alternative has been estimated based on a variety of key assumptions. The estimated timeframes to achieve the RAOs vary among alternatives and were developed using groundwater flow and solute transport models based on data collected during the ESRI. Remedy components that were used in the cost estimate are summarized in **Table 5**.

The estimated present worth costs for the alternatives, not including the No Action alternative, range from $585,000 for Alternative 2 (MNA) to $7.91 million for Alternative 4 (ISCO). Alternative 5 (ERD) is expected to cost approximately $3 million more than Alternative 2, and Alternative 3 (AS) is

Table 6 – Comparative Analysis of Alternatives

CERCLA Criteria	No Action	MNA and LUCs	Air Sparging, MNA, and LUCs	ISCO, MNA, and LUCs	ERD, MNA, and LUCs
	(1)	(2)	(3)	(4)	(5)
Threshold Criteria					
Protection of Human Health and the Environment	○	●	●	●	●
Compliance with ARARs	○	●	●	●	●
Primary Balancing Criteria					
Long-term Effectiveness and Permanence	○	◐	◐	●	●
Reduction in Toxicity, Mobility, or Volume through Treatment	○	○	●	●	●
Short-term Effectiveness	○	●	◐	◐	●
Implementability	●	●	◐	◐	◐
Present-worth Cost	$0	$585k	$5.46M	$7.91M	$3.65M

Relative Ranking: ●High ◐Moderate ○Low
Rankings are provided as qualitative descriptions of the relative compliance of each alternative with the criteria

estimated to cost approximately $4.9 million more than Alternative 2. Cost summaries can be found in **Table 5**.

8.3 Modifying Criteria

State Acceptance

State involvement has been solicited throughout the CERCLA and remedy selection process. NCDENR supports the Preferred Alternative, and its final concurrence will be solicited following the review of all comments received during the public comment period.

Community Acceptance

Community acceptance will be evaluated after the public comment period for this PRAP.

9. Preferred Alternative

Alternative 2, MNA and LUCs, was selected as the Preferred Alternative for remediation of groundwater at Site 86. The preferred alternative consists of the following:

- Annual VOC groundwater monitoring of 30 wells and collection of NAIPs every 5 years to evaluate progress toward achieving cleanup levels.
- LUCs to prohibit aquifer use and to require evaluation of vapor intrusion pathways if future changes in building or land use occur.

Alternative 2 is preferred because previous actions have removed the highest concentrations of VOC mass, NA is ongoing to further degrade VOCs in a reasonable timeframe, and solute transport modeling suggests that MNA will be protective of the New River.

Alternative 2 is also significantly less expensive than Alternatives 3, 4, and 5, which would still require MNA and LUCs; and based on modeling results, active treatment may only reduce the remedial timeframe by 13 years. Lastly, the only remaining unacceptable risk is based on the potable use of groundwater and potential for vapor intrusion based on future building use, which will be restricted through LUCs.

LUCs, including, but not limited to, land use restrictions in the Base Master Plan, Notice of Inactive Hazardous Substance or Waste Disposal, file a Notice of Contaminated Site with the Onslow County Register of Deeds, and administrative procedures to prohibit unauthorized intrusive activities (for example, well installation or construction) will be implemented as part of the remedy to prevent exposure to the contamination on the site that exceeds the cleanup levels.

Consideration of vapor intrusion is recommended prior to any new construction or changes to existing building use or structure within the LUC boundary. The LUCs will be implemented and maintained by the Navy and MCIEAST-MCB CAMLEJ until the concentration of hazardous substances in groundwater are at such levels to allow for unlimited use and unrestricted exposure. The LUC performance objectives include:

- To prohibit exposure to, and use of, the surficial and Castle Hayne aquifers underlying Site 86
- To mitigate exposure of COCs in indoor air from vapor intrusion pathways, if future changes in building or land use occur
- To maintain the integrity of any existing or future monitoring well network at the site

The estimated LUC boundaries are provided in **Figure 5**; the actual LUC boundaries will be finalized in the Remedial Design (RD). The LUC implementation actions, including monitoring and enforcement requirements, will be provided in a Land Use Control Implementation Plan (LUCIP) that will be prepared as part of the RD.

The Navy will submit the LUCIP and RD to EPA and NCDENR for review and approval pursuant to the primary document review procedures stipulated in the Federal Facility Agreement. The Navy will maintain, monitor (including conducting periodic inspections), and enforce the LUCs according to the requirements contained in the LUCIP and the RD. The need for LUCs to prohibit exposure and ensure protection will be periodically reassessed as COC concentrations are reduced over time.

Based on information currently available, the Navy, MCIEAST-MCB CAMLEJ, EPA, and NCDENR believe the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Navy expects the Preferred Alternative to satisfy the following requirements of CERCLA: (1) protects human health and the environment, (2) complies with ARARs, (3) is cost-effective, (4) uses permanent solutions and alternative treatment technologies to the maximum extent practicable. Although the Preferred Alternative does not satisfy the statutory preference for treatment as a principal element, no source materials constituting principal threats are present, trends over time indicate that NA of groundwater will be effective and degrade VOCs in a reasonable timeframe, and the groundwater is currently not used for drinking water and LUCs will prohibit exposure until concentrations allow for unlimited use and unrestricted exposure.

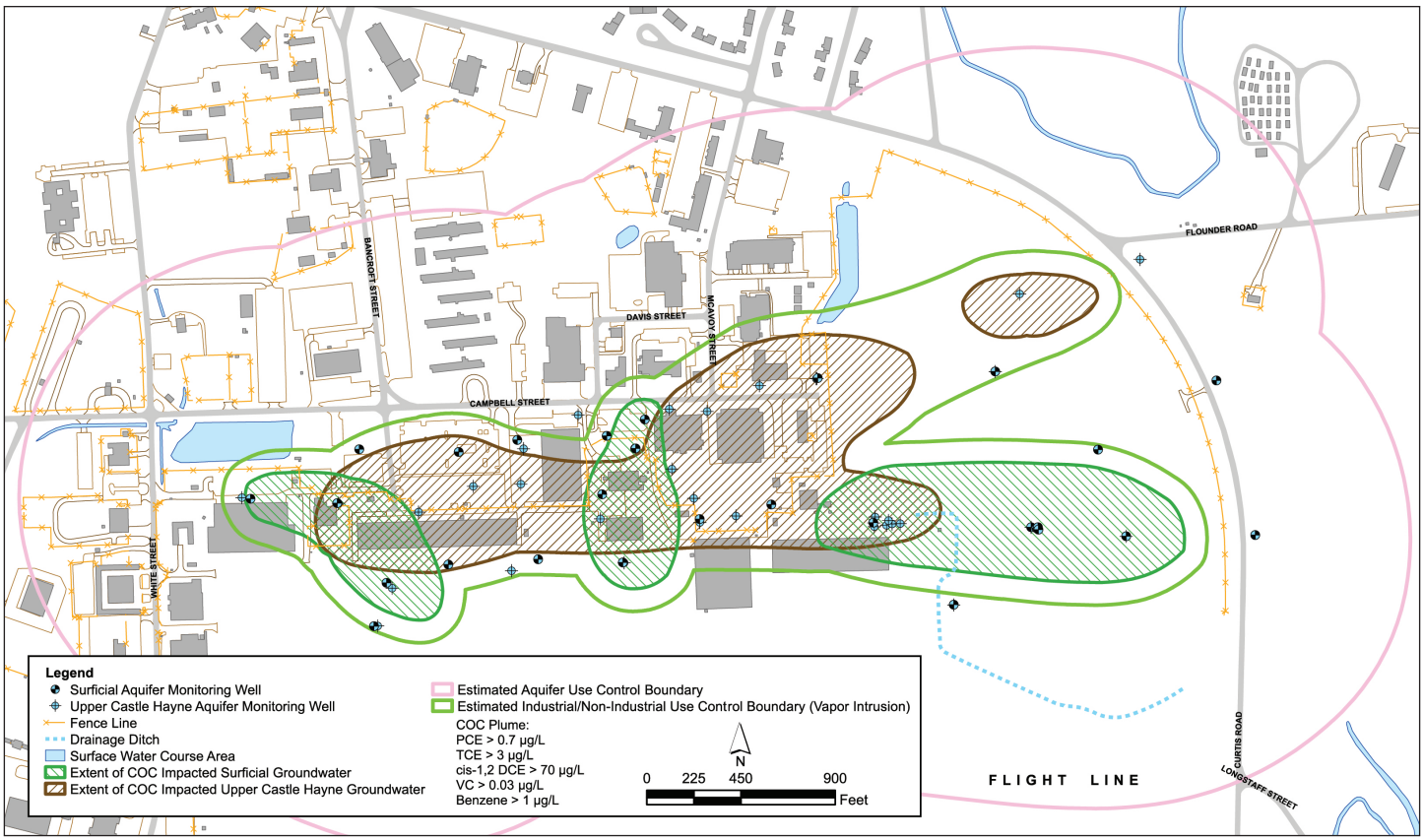
The Preferred Alternative can change in response to public comment or new information.

Because COCs will remain at the site above levels that allow for unlimited use and unrestricted exposure, the Navy will review the final remedial action no less than every 5 years after initiation of the remedial action, in accordance with CERCLA Section 121(c) and the NCP at 40 CFR 300.4309f)(4)(ii). If results of the 5-year reviews reveal that remedy integrity is compromised and protection of human health is insufficient, additional remedial actions would be evaluated by the parties and implemented by the Navy.

10. Community Participation

The Navy and EPA provide information regarding environmental cleanups at Site 86 to the public through the Restoration Advisory Board, public meetings, the Administrative Record file for the site, the Information Repository, and announcements published in Jacksonville Daily News, The Globe, and RotoVue. The public is encouraged to gain a more comprehensive understanding of Site 86 and the IRP. The public comment period for this

Figure 5 - Estimated LUC Boundary



PRAP is from February 10, 2014 to March 14, 2014, and a public meeting will be held on February 26, 2014 at 6:00 PM (see page 1 for details). The Navy will summarize and respond to comments in a Responsiveness Summary, which will become part of the official ROD and will also be included in the Administrative Record file.

Location of Administrative Record and Information Repository

Available online at: http://go.usa.gov/Dy5T

Internet access is available at the
Onslow County Library
58 Doris Avenue East
Jacksonville, NC 28540
(910) 455-7350

During the comment period, interested parties may submit written comments to the following addresses:

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Glossary of Terms

This glossary defines in non-technical language the more commonly used environmental terms appearing in this PRAP. The definitions do not constitute the Navy's, EPA's, or NCDENR's official use of terms and phrases for regulatory purposes, and nothing in this glossary should be construed to alter or supplant any other federal or state document. Official terminology may be found in the laws and related regulations as published in such sources as the Congressional Record, Federal Register, and elsewhere.

Administrative Record: A compilation of site-related information for public review.

Air sparging (AS): Injection of contaminant-free air into the subsurface saturated zone, enabling a phase transfer of hydrocarbons from a dissolved state to a vapor phase while also promoting aerobic biodegradation of COCs in groundwater.

Applicable or Relevant and Appropriate Requirements (ARARs):

- Applicable requirements, as defined in 40 CFR § 300.5, are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by the state in a timely manner and that are more stringent than federal requirements may be applicable.
- Relevant and appropriate requirements, as defined in as defined in 40 CFR § 300.5, means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at a CERCLA site that their use is well suited to the particular site. Only those state standards that are identified by the state in a timely manner and that are more stringent than federal requirements may be relevant and appropriate.

Aquifer: Underground bed of soil or rock from which groundwater can be usefully extracted. At MCIEAST-MCB CAMLEJ, there are two aquifers that are affected by contamination. The surficial aquifer ranges in depth from ground surface to 25 feet bgs. The Castle Hayne aquifer extends below the surficial aquifer to a depth of roughly 180 feet bgs. The upper most region of this aquifer is known as the upper Castle Hayne (25 to 60 feet bgs).

Cancer risk: Cancer risks are expressed as a number reflecting the increased chance that a person will develop cancer if exposed to chemicals or substances. For example, EPA's acceptable risk range for CERCLA sites is 1×10^{-4} to 1×10^{-6}, meaning there is 1 additional chance in 10,000 (1×10^{-4}) to 1 additional chance in 1 million (1×10^{-6}) that a person will develop cancer if exposed to a site that is not remediated.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA): A federal law, commonly referred to as the Superfund Program, passed in 1980 and amended in 1986 by the Superfund Amendments and Reauthorization Act codified at 42 United States Code §§ 9601 et seq., and amended again in 2000. CERCLA created a trust fund known as the Superfund, which is available to EPA to investigate and clean up abandoned or uncontrolled hazardous waste sites.

Conceptual site model (CSM): A description of a site and its environment that is based on existing knowledge and that assists in planning, interpreting data, and communicating. It describes sources of contamination (for example, spills) and receptors (for example, humans) and the interactions that link the two.

Chemical of concern (COC): A subset of the constituents of potential concern that are identified in the ESRI/FS as needing to be addressed by the proposed remedial action.

Ecological risk assessment (ERA): An evaluation of the risk posed to the environment if remedial activities are not performed at the site.

Enhanced reductive dechlorination (ERD): An anaerobic (without oxygen) process in which an electron donor source is injected into the subsurface to allow chlorine atoms on a parent VOC molecule to be sequentially replaced with hydrogen and break down COCs.

Expanded supplemental remedial investigation (ESRI): A study to determine the nature and extent of contaminants present at a site and the problems caused by their release.

Feasibility study (FS): An investigation of the nature and extent of contamination at a given site, for the purpose of developing and evaluating remedial alternatives, as appropriate.

Groundwater: Subsurface water that occurs in soils and in geologic formations that are fully saturated.

Hazard index (HI): A number indicative of non-cancer health effects that is the ratio of the existing level of exposure to an acceptable level of exposure. A value equal to or less than 1 indicates that the human population is not likely to experience adverse effects.

Human health risk assessment (HHRA): An evaluation of the risk posed to human health should remedial activities not be implemented at a site.

Hazard quotient (HQ): the ratio of the exposure estimate to an effects concentration considered to represent a "safe" environmental concentration or dose.

Information Repository: A file containing information, technical reports, and reference documents regarding an NPL site. This file is usually maintained at a location with easy public access, such as a public library.

Installation Restoration Program (IRP): The Navy, as the lead agency, acts in partnership with EPA and NCDENR to address environmental investigations at the facility through the IRP. The current IRP is consistent with CERCLA and applicable state environmental laws.

In situ chemical oxidation (ISCO): Use of oxidizing chemicals to break down groundwater contaminants into carbon dioxide and water. ISCO can be implemented via horizontal or vertical injection wells.

Land use controls (LUCs): Physical, legal, or administrative methods that restrict the use of or limits access to property to reduce risks to human health and the environment.

Lead agency: Represented by a Remedial Project Manager (RPM) that has the primary responsibility for coordinating a response action. EPA, a state environmental agency, or another federal agency can serve as the lead agency. Generally, the lead agency RPM is responsible for overseeing all technical, enforcement, and financial aspects of a remedial response.

Maximum contaminant level (MCL): MCLs are standards that are set by the EPA for drinking water quality. An MCL is the legal threshold limit on the amount of a substance that is allowed in public water systems under the Safe Drinking Water Act.

Media: Soil, groundwater, surface water, or sediments at the site.

Monitored natural attenuation (MNA): Periodic monitoring of groundwater or surface water to track changes in COC concentrations and NA parameters.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP): Provides the organizational structure and procedures for preparing for and responding to discharges of oil and releases of hazardous substances, pollutants, and contaminants.

National Priorities List (NPL): A list developed by EPA of uncontrolled hazardous substance release sites in the United States that are considered priorities for long-term remedial evaluation and response.

Natural attenuation (NA): Reduction in mass or concentration of a constituent over time or distance from the source through naturally occurring physical, chemical, and biological processes.

Nine evaluation criteria: The NCP outlines the approach for comparing remedial alternatives using the following evaluation criteria:

- Overall Protection of Human Health and the Environment – Addresses whether a remedy provides adequate protection and how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.
- Compliance with ARARs – A statutory requirement for remedy selection that an alternative will either meet all of the ARARs or that there is a good rationale for waiving an ARAR.
- Long-term Effectiveness and Permanence – Addresses the expected residual risk that will remain at the site after completion of the remedial action and the ability of a remedy to maintain reliable protection of human health and the environment in the future as well as in the short term.
- Reduction of Toxicity, Mobility, and Volume through Treatment – The anticipated performance of the treatment technologies that a remedy may employ in their ability to reduce toxicity, mobility or volume of contamination.
- Short-term Effectiveness – Considers the short-term impacts of the alternatives on the neighboring community, the plant workers, remedial construction workers, and the surrounding environment, including potential threats to human health and the environment associated with the collection, handling, treatment, and transport of hazardous substances.
- Implementability – The technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement an option.
- Cost – Encompasses all construction, operation, and maintenance costs incurred over the life of the project, expressed as the net present value of these costs.
- State Acceptance – Considers substantial and meaningful state involvement in the PRAP.
- Community Acceptance – The public's general response to the alternatives described in the PRAP and the ESRI and FS reports. The specific responses to the public comments are addressed in the Responsiveness Summary section of the ROD.

Nonaqueous phase liquids (NAPLs): Either singular free-product organic compounds or mixtures of organic compounds that are resistant to mixing with water. NAPL zones are the delineated portions of the subsurface (including one or more aquifers) where such liquids (free-phase or residual NAPL) are present. There are two types of NAPLs: Light Non-Aqueous Phase Liquids (LNAPLs) and Dense Non-Aqueous Phase Liquids (DNAPLs):

- LNAPLs are less dense than water and tend to float on the water table.
- DNAPLs have a density greater than water. This property allows them to sink through the water table and penetrate the deeper portions of an aquifer.

North Carolina Department of Environment and Natural Resources (NCDENR): The state agency responsible for administration and enforcement of state environmental regulations.

North Carolina Groundwater Quality Standards (NCGWQS): Enforceable standards developed by NCDENR. They are the maximum allowable contaminant concentrations resulting from any discharge of contaminants to the land or waters of the state, which may be tolerated without creating a threat to human health or which would otherwise render the groundwater unsuitable for its intended best usage.

Operable unit (OU): A discrete action that comprises an incremental step toward comprehensively addressing site problems. The cleanup of a site can be divided into a number of OUs, depending on the complexity of the problems associated with the site. OUs can address geographical portions of a site, specific site problems, or different phases of remediation at a site.

Plume: A concentration of contaminants in air, soil, or water usually extending from a distinct source.

Proposed Remedial Action Plan (PRAP): A document that presents and requests public input regarding the proposed cleanup alternative.

Public comment period: The time allowed for the members of an affected community to express views and concerns regarding an action proposed to be taken by the Navy and EPA, such as a rulemaking, permitting, or Superfund remedy selection.

Rebound: An increase in contaminant concentrations after a treatment system has been turned off. It occurs because not all contamination has been removed and, as the subsurface returns to equilibrium, additional dissolution of residual contamination occurs.

Receptors: Humans, animals, or plants that may be exposed to risks from contaminants related to a given site.

Record of Decision (ROD): A public document that explains which cleanup alternative(s) will be used at NPL sites where, under CERCLA, trust funds pay for the cleanup.

Remedial action: A cleanup method proposed or selected to address contaminants at a site.

Remedial action objectives (RAOs): Objectives of remedial actions that are based on contaminated media, COCs, potential receptors and exposure scenarios, human health and ecological risk assessments, and attainment of regulatory cleanup levels, if any exist.

Site: The area of a facility where a hazardous substance, hazardous waste, hazardous constituent, pollutant, or contaminant from the facility has been deposited, stored, disposed of, placed, has migrated, or otherwise come to be located.

Source: The main source areas located at Site 86 include: the former AST area, the helicopter wash pad, several hangars, SWMUs 303 and 318, a gas station and garage, and building AS510.

U.S. Environmental Protection Agency (EPA): The federal agency responsible for administration and enforcement of CERCLA (and other environmental statutes and regulations), and with final approval authority for the selected remedy.

Vapor intrusion: The migration of volatile chemicals from the subsurface into overlying buildings.

Volatile organic compound (VOC): A compound that easily vaporizes and has low water solubility. Many VOCs are manufactured chemicals, such as those associated with paint, solvents, and petroleum. VOCs are common groundwater contaminants. The five main VOCs of concern at Site 86 are benzene, PCE, TCE, cis-1,2-DCE, and VC.

Please print or type your comments here

Mark Your Calendar for the Public Comment Period

Public Comment Period

February 10, 2014 -
March 14, 2014

Submit Written Comments

The Navy will accept written comments on this Proposed Remedial Action Plan during the public comment period. To submit comments or obtain further information, please refer to the names and contact information included at the end of Section 10. A blank sheet has been added at the end of this document to be used for writing comments.

Attend the Public Meeting

February 26, 2014
at 6:00 PM

Coastal Carolina
Community College
Business Technology Building, Room, BT105
444 Western Blvd
Jacksonville, NC 28546

The Navy will hold a public meeting to explain the Proposed Remedial Action Plan. Verbal and written comments will be accepted at this meeting.

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Place stamp here

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